20th CONGRESS. 1st Session. [Doc. No. 284.] HO. OF REPS. War Dept.

SURVEY OF THE MUSCLE SHOALS.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

The information required by a resolution of the House of Representatives of the 16th January last,

IN RELATION TO AN EXAMINATION OF THE

MUSCLE SHOALS IN TENNESSEE RIVER,

WITH A VIEW TO

Removing the Obstructions to the Navigation thereof,

AND THE

CONSTRUCTION OF A CANAL AROUND THE SAME.

MAY 14, 1828.

Read, and referred to the Committee of the Whole House to which is committed the bill from the Senate, [No. 46,] to grant certain relinquished and unappropriated lands to the State of Alabama, for the purpose of improving the navigation of the Tennessee, Coosa, Cahawba, and Black Warrior rivers.

WASHINGTON:

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1828.

DEPARTMENT OF WAR,
May 14, 1828.

SIR: In compliance with so much of the resolution of the House of Representatives, dated the 16th of January last, as directs the Secretary of War to communicate to the House a report of the examination made by the United States' Engineers, of the Muscle Shoals, in Tennessee river, with a view to the practicability of removing the obstructions to the navigation thereof, or of the construction of a canal around the same, I have the honor to present, herewith, a letter from the Chief Engineer, accompanied by the report called for by the resolution.

I have the honor to be, sir,
Very respectfully,
Your obedient servant.
JAMES BARBOUR.

Hon. ANDREW STEVENSON,
Speaker of the House of Representatives, in Congress.

ENGINEER DEPARTMENT,

May 14, 1828.

SIR: I have now the honor to submit, herewith, the report of the examination made by the United States' Engineers, of the Muscle Shoals, in Tennessee river, with a view to the practicability of removing the obstructions to the navigation thereof, or of the construction of a canal around the same, called for by a resolution of the House of Representatives, dated the 16th of January last.

To prepare a copy of the report would occupy so much time, that it has been deemed proper to transmit the original, with a request that it may be returned to the Department, when no longer required by the House of Representatives.

I have the honor to be, sir,

Very respectfully,

Your obedient servant.

ALEX. MACOMB.

Maj. Gen. Chief Engineer.

Hon. JAMES BARBOUR,

Secretary of War.

REPORT

Of the Board of Internal Improvement on an examination of the Muscle Shoals and Colbert's Shoal, made by orders from the War Department, dated March 12th, 1827.

The Board having been directed to proceed to the examination of the Muscle Shoals and Colbert's Shoal, as soon as they should have performed the duties assigned to them, during last summer, in Florida and Louisiana, they intrusted an officer with some preliminary surveys, the object of which was to ascertain, with a sufficient degree of precision, the main data upon which should be predicated the practicability and mode of the improvement contemplated. Lieut. Jefferson Vail, employed with the Board, was detailed for these duties, and performed the surveys from Brown's Ferry to Florence; but a severe illness having prevented him from completing his operations as far down as Waterloo, the preliminary surveys from Florence to Waterloo were made by Mr. F. Sannoner, Civil Surveyor, employed in the office of the Surveyor General of Alabama.

The reconnoitring maps and sheets of profiles hereto annexed, present the results obtained by these preliminary surveys, and will be referred to in this report, which, under the following heads, will comprehend the facts and investigations derived from the examination made by the Board.

1st. Description of Tennessee river from Brown's Ferry down to Waterloo:

2d. Mode of improving this part of Tennessee river:

3d. Surveys which are to be executed to enable the Board to plan the work and make an estimate of the cost:

4th. Advantages which would result from the improvement of the Muscle Shoals and Colbert's Shoal.

DESCRIPTION OF THE RIVER FROM BROWN'S FERRY TO WATERLOO.

*Bed of the River.**

At Brown's Ferry the depth of the river is as much as 25 feet; but; lower down, this depth suddenly diminishes, the stream becomes shallow, and there commences the chain of obstructions which impedes the navigation as far down as the mouth of Sweet Water creek, half a mile above Florence, and 36½ miles below Brown's Ferry.

On the greater part of this distance, the river spreads to a width varying from ½ to 1½ mile; its bed is obstructed by strata of compact limestone rock, mixed with flint stone, over which a rapid cur-

* See Gen. Map No. 6, and Sheets Nos. 1 & 2.

rent does not leave more than 12 inches of water at low stage. Indeed, out of this distance, some intervening portions are deep enough for small boats; but their channels are dangerous, on account either of a rapid current, or of projecting rocks lying at their bottom. Besides, on the whole distance, the river being encumbered with a great number of islands, between which the channel is much contracted, the current, owing to this circumstance and to the great declivity of the bed of the river, opposes considerable difficulties to the ascending navigation, and serious dangers to the descending boats.

At about 2½ miles below Brown's Ferry, and on the right shore, commences a natural channel, running between the main and an island stretching down to within one mile from the mouth of Elk river. This channel, called the sluice, has a length of 7¾ miles, with a width varying generally from 12 to 50 yards, and a depth of about 2 feet at the shallow places. The bottom is rocky; the banks, on each side, are high and firm, but they are overflown in times of freshets; the channel is now much obstructed by drifted woods.

From Brown's Ferry to Melton's Bluff, the descending boats keep within the left bank of the river, and then steer for the mouth of Elk river; on this distance, of about 9¾ miles, 18 inches, at low water,* is the depth which can be carried throughout.

Opposite the mouth of Elk river, and across the river, there is a shoal, over which there is but 6 inches of water. The boats pass over this shoal, close round the bluff lying below the mouth of Elk river, and then follow the left shore to Lamb's Ferry: the distance from Elk river to Lamb's Ferry is 1½ mile, and that from the foot of the shoal to the Ferry, 3 miles, with a depth of 6 and 7 feet.

From Lamb's Ferry to Green's Bluff, but 8 inches can be carried through the whole distance, which is 6½ miles. The boats, before reaching the shore of Green's Bluff, follow about the middle of the river, where, at some places, 12 inches is the least depth. Between Green's Bluff and the mouth of Blue Water creek, Cedar Ripple makes across the stream, and leaves, between it and the Bluff, a channel, hardly 50 feet wide, and running but five or six feet from the shore. At this place, the depth is 3 feet; the current is rapid, and directed almost perpendicularly against the steep rock of the bank: circumstances which render this passage not only difficult, but also dangerous.

The boats, once through this pass, steer for the right side of the river, keeping along it down to Taylor's Bluff, whence they make for the head of the rapid of Gallop Water. On this distance of 8 miles, 10 inches can be carried through, and two shoals are passed over: one (Creek bar) immediately below Double-Head Bluff, the other half a mile above Taylor's Bluff. On this distance, the navigation cannot be deemed dangerous, though obstructed by several rapids and bars; many eddies are caused by abrupt falls backing up the water; and in most of these eddies, the river is deep and almost still.

*The depth of water, in this description, will always be given at low stage in the river, unless otherwise expressed.

From the head of Gallop Water to Campbell's Ferry, the distance is 3 miles. On this short portion of the river, the difficulties opposed to the navigation are considerable: indeed, it is a series of rapids, shoals, bars, and falls, through which the boats are obliged to steer their course, and to contend with the violence and irregularity of the current. Amongst these obstructions, that called by the boatmen the Big Jump consists of a ledge of rocks, stretching from shore to shore, and causing a sudden fall of about 4 feet. In the middle of this ledge, there is a kind of breach or gap, from 30 to 40 feet wide, through which the water rushes with great rapidity. The boats descending the river have to pass through this narrow channel, the difficulty of which is increased by the danger of striking the rocks projecting out of the bottom. Except on a short distance, at Gallop Water, where there is a depth of 3 and 4 feet, 18 inches only can be carried through down to Campbell's Ferry.

After having passed over these obstructions, the boats descend to the mouth of Sweet Water creek, in following the right shore of the river. On this distance of 4 miles, two main shoals are met with: one a little below Campbell's Ferry, the other not far above Sweet Water creek. Between them, the river affords, at many places, as much as 3 feet of water; but 18 inches only can be carried through the whole distance.

From Sweet Water creek down to Florence Ferry, the river is navigable for boats drawing at least 3 feet. The distance is 1½ mile.

The course just pointed out, from Brown's Ferry down to Florence Ferry, is kept, at low stage of water, by either the descending or the ascending boats. However, at high water, another course, from Green's Bluff to Florence Ferry, may be steered up as well as down the stream. This course, from Green's Bluff to the head of Gallop Water, follows the side of the river, and passes over Town Creek bar and Creek bar. From the head of Gallop Water to Campbell's Ferry, the boats take the course just now described; but from Campbell's to Florence Ferry, the boats keep along the left shore. By either course, the distance from Brown's Ferry to Florence Ferry is nearly the same, and may be assumed at 37 miles.

The navigation of the Tennessee, below Florence Ferry,* is far less obstructed than above; and, though four shoals are to be passed over before reaching Waterloo, yet the intervening portions of the river afford a tolerable good depth at the lowest stage of water. Besides, the bed of the stream having not a great declivity, the current is generally moderate, except over the obstructions which impede the navigation. From Florence Ferry to Waterloo, the river is less encumbered with islands, and its width generally narrower than above Florence.

After leaving Florence, the descending boats steer for the upper end of Seven Mile Island, and keep about the middle of the stream; they then enter into the channel running between the right shore

* See Sheet No. 3.

and Seven Mile island, and reach the head of Little Buck Shoal. The distance is 6 miles, 6 feet can be carried through; at some places, 7 and 8 feet are to be found.

At the Little Buck Shoal, the depth is but 18 inches, and the water is shallow all over across the river. This obstruction extends about half a mile, after which 6 feet can be carried as far down as the head of the Colbert's Shoal, and on a distance of 14½ miles; the boats, after leaving the lower point of Seven Mile Island, keep down to Colbert's Shoal, within the middle and right side of the stream.

Colbert's Shoal extends across the river at Colbert Island: its width, in the direction of the current, is about one mile: it consists chiefly of sand, and of broken gravel: some loose rocks occasionally occur. On this obstruction, are scattered many small hillocks, formed of sand and gravel, cemented together around rocks, and covered with a vegetation of long aquatic grass. These hillocks, called hills by the boatmen, average from 8 to 10 feet superficies: some of them are bare at low water, others are covered with 15 or 18 inches of water. A good depth is found between these obstructions, but to steer through them is difficult, and renders the navigation most intricate—circumstances which limit to 15 or 18 inches the depth which can be carried through Colbert's Shoal.

Two passes are followed through this shoal: one running close to the northern shore of Colbert's Shoal, the other sweeping along the right side of the river, and within 12 feet from the shore. The difficulty of this pass consists in a ledge of rocks, making out of the shore, on a length of about 70 yards, and a width of 15 feet; and confining the best water within but about 15 feet. The small hillocks are less numerous in this pass than in the other, which renders the former preferable to the pass along Colbert's Island.

From the foot of Colbert Shoal to the upper end of Waterloo island, the boats keep on the right side of the river: the distance is 4½ miles, and 2½ feet can be carried through; and, on the greater portion of it, as much as 5, and even, at some places, 10 feet. Two bars, on this distance, make across the stream: one immediately below Colbert's island, the other immediately above the mouth of Yellow-Spring Creek.

From opposite the upper end of Waterloo island, down to Waterloo, the boats keep along the left side of the river, till they reach the head of Bee Tree Bar. This obstruction is formed of sand, and lies between Bee Tree island and the mouth of Second Creek; 18 inches only can be carried over it, and that for a distance of half a mile. The distance from the upper end of Bee Tree island to Waterloo is 2 miles; except over Bee Tree Bar, 2 feet can be carried through. There is another bar, called Rocky Bar, lying between the upper end of Waterloo island and the main: it leaves, along the right shore, a passage about two feet deep.

The boats ascending the river from Waterloo to Florence, follow the same course as that just described, and this either at high or low water.

From the above description, the state of the navigation of the Tennessee river, at low water, from Brown's ferry down to Waterloo, may be resumed as it follows:

	Distance. *miles.*	Draft of water. *ft.*	*in.*
From Brown's Ferry to the mouth of Elk river,	9½	1	6
the mouth of Elk river to Lamb's Ferry	4½	on ½ mile	6
do do		on 3 miles 6	
Lamb's Ferry to Green's Bluff	6½		8
Green's Bluff to Gallop Water	8		10
Gallop Water to Campbell's Ferry	3	1	6
Campbell's Ferry to the mouth of Sweet Water creek	4	on 2½ miles 1	6
do do		on 1½ mile 3	
the mouth of Sweet Water C. to Florence Ferry	1½	3	
Distance from Brown's Ferry to Florence Ferry, - -	37 miles.		

Out of these 37 miles, but 6 afford a depth above 3 feet; on the remainder, the greatest depth is not more than 18 inches.

	miles.	*ft.*	*in.*
From Florence Ferry to Little Buck Shoal	6	6	
Little Buck Shoal to Colbert's Shoal	15	on ½ a mile 1	6
do do		on 14½ miles 6	
Head of Colbert's Shoal to Foot of Colbert's Shoal	1	1	3
Foot of Colbert's Shoal to Upper end of Waterloo Island	4½	on 1 mile 2	6
do do		on 3½ miles 5	
Upper end of Waterloo Island to Waterloo	2	on ½ a mile 1	6
do do	—	on ½ a mile 2	
Distance from Florence Ferry to Waterloo - - -	28½		

Out of these 28½ miles, 24 miles present a depth of at least 5 feet; on the remaining distance, the least depth is 15 inches, and the greatest, 2½ feet.

The depth of water given in the foregoing description is that found at the lowest stage of water in the stream. At the time of freshets, though a much greater height of water is to be expected, yet the rise over the obstructions is much less than at the other places, on account both of the great rapidity of the current and of the great expansion of the river at these points. The common rise, caused by freshets, at the following points, may be assumed to be, viz.

Over the main falls and rapids,	from 4 to 5 feet,
At Brown's ferry,	12
At Lamb's ferry,	10
At Cambell's ferry,	8
At Florence,	from 18 to 20
At Waterloo,	30

Banks of the river.

(See Sheets Nos. 1, 2, 3.)

Right or Northern Bank.—From Brown's ferry to the mouth of Elk river, a low flat bottom, subject to inundation, extends along the right shore; it is only interrupted, on a quarter of a mile, by Potter's bluff, about ½ mile above the mouth of Elk river: however, this bluff is not abrupt on the water edge, but slides gradually towards the river. Distance 11 miles.

From the mouth of Elk river to Lamb's ferry, except immediately below the mouth of this tributary, where the hill makes, for about ½ a mile, close to the river, a flat bottom, subject to be overflown, stretches along the shore. Distance 4 miles.

A similar flat bottom extends from Lamb's ferry to Dutch landing, nearly opposite to Green's bluff; but, half a mile above the landing, the hill approaches gradually nearer and near to the water edge; and, on a short distance, hangs perpendicularly on the river; at this place, the stream has a depth of at least 20 feet. Distance 6 miles.

Except at Double Head bluff and Taylor's bluff, the right shore, from Dutch landing to Shoal creek, nearly opposite to the foot of Gallop Water, is a flat bottom, subject to inundation. Double Head bluff extends about ¾ of a mile along the river, towards which it has, however, a gradual declivity, making, perhaps for 300 yards, close to the water edge. As to Taylor's bluff, it makes close to the water edge, on a distance of about 250 yards, but its slope towards the stream is not abrupt. Distance 9 miles.

From Shoal creek to opposite Campbell's ferry, and thence to the mouth of Sweet Water creek, the hills make generally close to the river, except for about half a mile above the creek, where is found a flat bottom. At many places the bluffs are high, rocky, and precipitous: the range of these hills has a length of about 6 miles. Distance 6½ miles.

From the mouth of Sweet Water to Florence ferry, there is a bottom, along the shore, subject to inundation. Distance 1¼ mile.

With the exception of a bluff found immediately above the mouth of Bluff creek, and opposite the lower end of Colbert island, the right shore of the river, from Florence ferry to Waterloo, is an uninterrupted flat bottom subject to be more or less overflown. The width of this flat bottom varies, generally, from ¼ to ¾ of a mile; however, opposite

Chickasaw island, and on a distance of about one mile, the hills leave but a narrow space between their foot and the water edge. Distance 28½ miles.

Left or Southern Bank.—From Brown's ferry down to Lamb's ferry, the bottom along the river is wide, low, and subject to inundation. However, for a distance of about ¼ of a mile, Melton's bluff makes close to the river, and its rocky and elevated mass stands perpendicularly on the water edge. Distance 14 miles.

Except at three places, viz: below Lamb's ferry, at the mouth of Town creek, and at Lamb's ferry, where short flat bottoms intervene, on an extent together of 4 miles, the left bank of the river, from Lamb's ferry to Florence ferry, is high, rocky, and generally abrupt: the whole distance is 23 miles.

From Florence ferry, down to Spring creek, a continuous chain of hills stretches along the river, and hangs perpendicularly on the water edge. The distance is 4½ miles.

From Spring creek to opposite Waterloo, the distance is 24½ miles; 16 miles are on the Chickasaw territory. Opposite the lower end of Seven Mile island, lies a perpendicular bluff, which extends about one mile along the water edge; and from Colbert's ferry down to Waterloo, about 8 miles, high hills confine upon the river. The remaining portions of the bank are formed of intervening flat bottoms.

On the right or northern side of the river, the face of the country is rather broken and hilly, though the hills do not approach as near to the water edge as they do on the opposite side. On this southern side, the face of the country is but slightly undulated, and the ground, by a gradual rise, reaches the fertile plain on which Courtland and Tuscumbia are situate. The country, on both sides, is pretty well settled; the main staples are cotton, corn, and small grains. Except the pine, the growth of trees offers a great variety of excellent building timber. Among the large masses of stratified limestone, forming the substratum of the country, no doubt can be entertained that good building materials will be easily procured from convenient distance.

Let us now take a view of the relative facility afforded, by either bank, to the route of a lateral canal parallel to the river.

Right Bank.

	Flat bottom.	Steep bluff.	Total.
From Brown's ferry to the mouth of Elk river	10¾	¼	11
Mouth of Elk river to Lamb's ferry -	3½	¼	3¾
Lamb's ferry to Dutch landing - -	5⅔	⅓	6
Dutch landing to Shoal creek - -	8	1	9
Shoal creek to Sweet Water creek -	6	½	6½
Sweet Water creek to Florence ferry -	1½		1½
Miles,	35⅚	2⅓	37¼

Therefore, from Brown's ferry down to Florence ferry, $35\frac{5}{8}$ miles, out of $37\frac{5}{8}$ miles, will afford nearly a level ground to the route of a lateral canal.

		Flat bottom.	Steep bluff.	Total.
From Florence ferry to Waterloo	Miles,	$27\frac{1}{2}$	1	$28\frac{1}{2}$

Consequently, with the exception of one mile, a continuous flat exists on the right side of the river, from Florence ferry down to Waterloo.

Left Bank.

	Flat bottom.	Steep bluff.	Total.
From Brown's ferry to Lamb's ferry -	$13\frac{3}{4}$	$\frac{1}{4}$	14
Lamb's ferry to Florence ferry -	4	19	23
Miles,	$17\frac{3}{4}$	$19\frac{1}{4}$	37

This result shows that, out of a distance of 37 miles, the left bank of the Tennessee, from Brown's ferry down to Florence ferry, presents more than 19 miles of difficult ground; a circumstance which gives to the opposite bank a decided advantage in relation to the route of a canal, lateral and parallel to the stream.

	Flat bottom.	Steep bluff.	Total.
From Florence ferry to Spring creek -	-	$4\frac{1}{2}$	$4\frac{1}{2}$
Spring creek to Waterloo, about	$15\frac{1}{2}$	9	$24\frac{1}{2}$
About Miles,	$15\frac{1}{2}$	$13\frac{1}{2}$	29

Result which gives to this portion of the left bank the disadvantage, when comparing its ground with that of the opposite shore.

Fall of the river.

(See Sheets Nos. 4 and 5, as also Nos. 1, 2, 3.)

A line of levels has been run from Brown's ferry to Florence ferry, and another from Florence ferry to Waterloo, in order to ascertain the fall of the stream between these points.

The former has been carried, by Lieut. Jefferson Vail, on the left of the river. The Board had intended that, after their examination, offsets should be taken from this line to the points of the stream, which would have proved to be the most important to the investigation of the subject. But Lieut. Vail having fallen sick before the arrival of the Board, and his assistant, Mr. James Swift, having been disabled previously to the survey of the Muscle shoals, this line of levels has remained unconnected with the river, except at its departing and terminating points: that is to say, at Brown's ferry and Florence ferry. The difference of level between these two points has been found, at low water mark, to be $163\frac{505}{1000}$ feet.

Respecting the other line, from Florence Ferry to Waterloo, it has been run, by Mr. F. Sannoner, Civil Surveyor, along the northern margin of the river; and the difference of level between the two extreme points has proved to be, at low-water mark, but $3\frac{84}{100}$ feet.

Tributaries emptying into the river.

(See sheets No. 1, 2, and 3.)

Right side.—The streams falling into the river, from Brown's ferry to Florence ferry, are the following:

Elk river, $11\frac{1}{2}$ miles below Brown's ferry, is a large stream, affording great deal of water, especially towards its outlet; its bottom is rocky: during the rainy season, boats may ascend this river as far up as Winchester, (Tennessee,) more than 100 miles from its mouth.

Burney's creek, $5\frac{1}{2}$ miles below Elk river, is a small, but constant stream.

Second creek, $1\frac{1}{2}$ mile below Burney's creek, and Bluewater creek, 2 miles lower down, are bold streams, and yield good deal of water: their fall is rapid.

Four Mile creek, 5 miles below Blue Water creek, and Six Mile creek, $1\frac{1}{2}$ mile lower down, are small, but never dry in Summer season.

Shoal creek, $1\frac{1}{2}$ mile below Six Mile creek, is a large stream, yielding a great quantity of water; the bottom is rocky, the bed is much depressed below the general surface of the country, and its slope appears to be gradual: the banks are high and rocky. At the bridge, on the Huntsville road, the width is about 130 yards. At the lowest stage of water, the average depth may be valued at five inches.

Sweet Water creek, 6 miles below Shoal creek, is a never failing spring.

From Florence Ferry down to Waterloo, besides Cypress creek, $1\frac{1}{3}$ mile below Florence Ferry, Bluff creek, at the foot of Colbert's Shoal, and Second creek, half a mile above Waterloo, many other streams or springs of minor importance empty into the river.

Left side.—Malett's creek, 2 miles below Brown's ferry, is a small stream, and yields very little water; in Summer it is often dry.

Spring creek, 9 miles below Malett's creek, yields a pretty good supply of water; its length, from the head to the mouth, is about 4 miles.

Big Nance creek, $7\frac{1}{2}$ miles below Spring creek, is a pretty large stream, but affords very little water during the Summer: its bottom is rocky, and depressed below the general surface of the country.

Town creek, 2 miles below Big Nance creek, is also a pretty large stream; it yields, throughout the year, a good supply of water.

The four creeks just enumerated are the only streams of consequence, on the southern side of the river, from Brown's Ferry to Florence Ferry; their bottom is rocky, their fall is gradual, and

their bed generally much depressed below the general surface of the country.

On this same southern side, and from Florence Ferry to Waterloo, the streams of some magnitude emptying into the river, are, Spring creek, 4½ miles below Florence Ferry, a constant stream susceptible to insure a steam-boat communication between the town of Tuscumbia and the river Tennessee; Little Bear creek, 2¾ miles below Spring creek; and, 5½ miles lower down, Caney creek, forming the boundary line between the State of Alabama and the Chickasaws.

From this short enumeration, it can be concluded that, with regard to supply of water and extent of boat-navigation, the tributaries on the northern side of the river, and more especially those between Brown's Ferry and Florence Ferry, are of greater importance than those emptying on the southern side.

We shall conclude this part of the report by submitting a general view of the river Tennessee, below and above the section just now described.

From Waterloo to the mouth of the Tennessee into the Ohio, the distance may be assumed 200 miles; and, from information, 3 feet can be carried through this distance, at low water mark, except over the following bars or shoals:

1st. Big Band Shoal, 28 miles below Waterloo; its extent is of about 3 miles. It makes from the right shore, and is gravelly, with some loose rocks scattered over, and covered with cemented gravels and aquatic grass: the passage is along the left side of the river: its depth, at low water, is 2 feet.

2dly. Duck river bar lies below the mouth of Duck river, and has an extent of three miles. It is rocky, and very dangerous, on account of the difficulty of steering through the rocks lying across the obstruction; however, it is said that never less than eight feet are to be found in the pass followed by the boats.

3dly. Leatherwood Shoal, not far above the mouth of the river; 2½ feet can be carried over this obstruction, at low water.

From Brown's Ferry up to the Suck, where the river forces its way through the Lookout mountain, the stream is said to be navigable, at low water, for boats drawing 3½ feet: the distance is about 140 miles.

At the Suck, the bed of the river is represented as being narrow, and confined between two precipitous cliffs; the current is rapid, more especially at the place called the Chute, but the depth of water is said to be great.

From the Suck to Kingston, a distance of about 115 miles, 2½ feet, it is said, might be carried through, during the boating season, were some improvements made in the bed of the river.

From Kingston to Knoxville, below the confluent of the Holston and French Broad, the distance is about 60 miles: two feet can be carried through during the boating season.

Therefore, the informations received being admitted, the navigation from the mouth of the Tennessee up to the confluent of the Hol-

ston and French Broad, at low water, and over the obstructions, give the following results:

	Distance. *miles.*		Draft of water. *ft.*	*in.*
From the mouth of the Tennessee to Waterloo - - - -	200	at least	2	0
Waterloo to Florence - -	28½	"	1	3
Florence to Brown's Ferry -	37	"	0	6
Brown's Ferry to the Suck -	140	"	3	6
the Suck to Kingston - -	115	boat'g season	2	6
Kingston to Knoxville - -	60	ditto	2	0
	580½ miles.			

This shows that, on this distance of 580 miles, measured on the general course of the river, the main impediments lie between Waterloo and Brown's Ferry; should these and those above mentioned be removed, the stream would be navigable, at low water, from its mouth to the Suck, a distance of 405 miles, for boats drawing 3 feet. On the remaining distance of 175 miles, from the Suck to Knoxville, the river, by means of improvements of minor importance, might be rendered navigable, during the boating season, for boats drawing 2 feet.

To this extent of navigation up and down the Tennessee, ought to be added the descending navigation of the Hiwassee, of the Upper Tennessee, of the French Broad, and of the Holston; but our informations on the subject are too vague to be introduced in this report.

Mode of improving the navigation of the Tennessee from Brown's ferry to Waterloo.

(See General Map, No. 6.)

From the foregoing description of the obstacles to the navigation between Brown's ferry and Florence, we may infer that, on this section, the bed itself of the river is not susceptible of being improved; the rocky nature of the bottom, the great fall between the extreme points, the great width from shore to shore, make it necessary to resort to a canal round this long chain of obstructions.

Respecting the route of such a canal, we must observe that, whilst the country is, on both sides, much elevated, and on the northern, broken, hilly, and deeply furrowed by the valleys of the tributaries, the margin on this side of the stream is, however, nearly a continuous flat-bottom land. A canal along this bottom will require embankments to guard against freshets, and aqueducts to cross the tributaries at their wide entrance into the river. As to the southern bank, it has been shown that, in relation to ground, supply of water, navigable tributaries, and, we may add, its northern exposure, this left side of the river has a decided disadvantage when compared to the opposite shore.

Although, immediately along the southern bank, the ground is much elevated above the bed of the river, and the tributaries are descending

from the south, yet the surface of the country, on a distance of two or three miles, is sloping gradually towards the south, till it reaches the plain on which stands Courtland. This observation, and the great difference of level (163 feet) between Brown's ferry and Florence ferry, lead to anticipate the practicability of a canal which would leave the river in the vicinity of Brown's ferry, run through the most favorable ground of the plain of Courtland, and terminate into the river at the mouth of Spring creek, two miles below Tuscumbia. The distance would be about thirty six miles; the chief resource, and, in summer, the only one, to feed the canal, should be derived from the Tennessee itself.

From the longitudinal profile,* hereto annexed, of the summit ground along the southern bank of the river, from Brown's ferry to Florence ferry, we may anticipate, that, though this ground is sloping towards the south, yet a canal in the direction of Courtland and Tuscumbia will require much deep cutting, and two aqueducts of some extent—one across Big Nance creek, the other across Town creek. The ground will likely prove of easy excavation, for a few feet below the surface; but, should it become necessary to sink much the bottom of the canal, to reach a proper level, it is to be apprehended that, at many places, the canal would have to be dug through strata of limestone: a circumstance which would materially increase the expense of construction, and the waste of water.

With regard to the route of canal along the northern margin of the river, as it has been just stated, embankments of proper elevation will become indispensable to shelter the work from the freshets, and long aqueducts will be required across the several tributaries emptying into the river. But the supply of water will be more secure, and the accommodation of the trade greater on this route than on the other. By either, the distance will be about thirty-seven miles, and the lockage about 163 feet.

Therefore, it is desirable that these two routes should be surveyed and levelled minutely, and their plan and estimate made to ascertain, as to expense, their comparative merit. Should the canal along the northern bank cost more than that through the plain of Courtland, it would remain to decide whether the extra cost would be compensated by a better accommodation of trade, and more especially of that through Elk river. But should, on the contrary, the expense for the canal through the plain of Courtland prove greater than, or even equal to, that for the canal along the northern bank of the stream, this route, then, would deserve a decided preference, on account of a more certain supply of water and of greater facilities to trade.

From the general view which has been hereabove sketched, in relation to the navigation from Knoxville down to the mouth of the river, we might infer that the canal recommended ought to receive such dimensions as to admit the passage of steam-boats at common stage of water in the river; and that the depth of water should be, at the least, four feet during the summer, and six during the boating season. However, taking into consideration that the present improve-

* See Sheets No. 4 and 5.

ment, though local, yet is destined to open the navigation of a river of about 600 miles, and therefore to become an object of national interest, it will be necessary to fit the work to an improved state of navigation in Tennessee river. Under this point of view, it is desirable that this river should be reconnoitred from Knoxville down to the Ohio, and the means for improving it pointed out, in order that the work at the Muscle Shoals should not only be fitted to the actual state of the river, but also to that which will result from future improvements. Such a reconnoitring might also enable to collect, with a sufficient degree of accuracy, the statistical details and data upon which the national importance of the work must be predicated.

Respecting the improvement of the navigation between Florence ferry and Waterloo, it has been shown, that, out of twenty-eight and a half miles, twenty-four afford a depth of five feet, at least; consequently, but four and a half miles will require to be improved.

Owing to the rocky and even shifting nature of the obstructions at Colbert's Shoals and at Bee Tree Bar, and taking advantage of the favorable ground presented at these places, on the northern margin of the river, we are of opinion that, for permanency and convenience, lateral canals are to be resorted to. One from the head of Colbert's Shoal to deep water, below the mouth of Yellow Spring, would have a length of about three miles; the other, leaving the stream at a point opposite to the upper end of Waterloo island, would terminate into deep water at Waterloo; the distance would be about two miles. To this must be added the deepening of Little Buck shoal on a distance of two-thirds of a mile.

Therefore, a permanent improvement, consisting of five miles of canal and four locks, will make this section of the Tennessee navigable, at low water, for boats drawing about five feet. And if, to this distance of five miles, is added that of a canal between Brown's ferry and Florence or Tuscumbia, we find that a total length of about forty-two miles of canals will be required to ensure, at any season of the year, the navigation of the Tennessee, from Brown's ferry to Waterloo, and on a distance of about sixty-six miles.

As to the expense in which the execution of this important improvement will involve, the board being not, at the present stage of their operations, furnished with the minute surveys upon which the plan and the estimate of the work must be predicated, it is out of their power to afford, at this time, any correct and detailed statement respecting the cost of the contemplated improvement. However, from general contemplations, they do believe that the expense of constructing a substantial work, properly fitted to its object, will not exceed one million of dollars.

Surveys to be executed.

As it has been stated in the beginning of this report, the preliminary surveys performed last summer at the Muscle Shoal, were limit-

ed to those necessary to ascertain the practicability of improving this section of Tennessee river, and the mode of doing it.

It remains now, in continuation of these preparatory surveys, to undertake those upon which a plan and an estimate of the work should be predicated. Such minute surveys, connected with a detailed reconnoitring of the Tennessee river, from its head branches down to the Ohio, will enable to fix upon the various improvements which this great artery of inland navigation will require; and, in order to show the propriety of commencing these operations as soon as practicable, we beg leave to submit some general views on the importance of the object now under consideration.

Advantages to be derived from the improvement of the Muscle Shoals.

Being not yet in possession of minute and correct data relating to the production, consumption, and trade of the fertile country watered by the Tennessee and its tributaries, it is not, at present, in our power to enter into the investigations tending to measure, by the standard of money, the main advantages which would be derived from the improvement of the Muscle and Colbert's Shoals; we must, therefore, confine ourselves within the range of those general considerations which, in a moral sense, may lead to anticipate the material benefits and other advantages of magnitude which would result from such an undertaking.

1st. Were the Tennessee to be made navigable from Waterloo to Brown's ferry, steamboats, throughout the year, or at least eight months out of twelve, would be able to navigate the river from its mouth to the Suck: that is to say, on a distance of more than 400 miles. During the boating season, and by means of improvements at some places, steamboats might ascend as far as Kingston, and even Knoxville, about 180 miles above the suck.

2dly. Exclusively of the valleys of the Holston and French Broad, the extend of country watered by the Tennessee and tributaries may be reckoned at 24,000 square miles, and its population (census of 1820) at 280 thousand inhabitants. The fertility of the soil, which is generally a rich limestone clay, and the healthiness of the climate, ensure, in times, to these districts, a rapid increase of hardy population.

3dly. Cotton, hemp, tobacco, and grain of every kind, may be deemed the main articles of cultivation; vine and silk have a fair prospect of succeeding; iron, lead, coal, gypsum, and salt, are the minerals found in the valley of the Tennessee and its upper branches, the Holston and French Broad. To this great and rich variety of products, which, in the present state of navigation, cannot conveniently find a market, must be added valuable timber of various descriptions, which would become an article of extensive trade.

4thly. The transportation of these valuable articles of trade is now made in unwieldy flat boats, which can descend the stream but at the periods of freshets. During the remainder of the year, and

more especially for the districts above the Muscle Shoals, the access to any market is entirely interdicted; and whilst the population cannot take advantage of the fluctuation of price in the market, their products are exposed, during transportation, to all the extra expenses, losses, deteriorations, and delays, inseparable from a tedious and difficult navigation. Consequently, these products are virtually of much less value than they would be, should the main obstructions of the river be removed.

5thly. A convenient navigation, by facilitating the exportation, would not only cause an increase of products, but also afford to the inhabitants the means of procuring, in exchange, the articles raised or manufactured in other sections of country; and those articles, by becoming cheaper, on account of a less expensive transportation, would fall to a price accessible to a greater number of consumers. At this time, the imports into these districts are chiefly made by wagons coming from Nashville, and even, when the Ohio is not navigable, from Baltimore and Philadelphia. Hence, it is easy to anticipate how much the expense of such transportation must add to the original cost of the articles; but, in order to be more precise on this point, we beg leave to submit here the statement made (in 1826) in the very able report of the Commissioners appointed by the States of Tennessee and Alabama to examine the Muscle Shoals.

According to said report, the transportation from Nashville to Knoxville amounts to $50 per ton; the same weight might be transported from Florence to Knoxville (were the Muscle Shoals improved) for $15; to which adding $5 for toll, would make the whole cost $20, and consequently produce an economy of $30 per ton. Again, the average freight, in steamboat, from New Orleans to Florence, is stated to be $25 per ton; from which we infer that, by adding to it the $20 for transportation from Florence to Knoxville, $45 would be the cost of transportation of a ton from New Orleans to Knoxville: that is to say, $5 less than the actual cost of transportation, in wagon, from Nashville to Knoxville. Therefore, were the river Tennessee improved, the transportation from New Orleans to Knoxville would cost less than that from Nashville to Knoxville.

6thly. No section of country is better provided than this with numerous and copious never failing streams, as also with abundance of fuel; none possesses more extensive means to associate agricultural with manufacturing industry; and, by ceasing to remain land-locked, these districts would acquire a cheap and commodious communication not only with the Gulph of Mexico, but also with the States bordering on the Mississippi and Ohio. They would, therefore, participate in the benefits derived from external and internal commerce, and contribute their share to the national advantages arising from these two great sources of wealth and revenue.

7thly. The country between the Shenandoah and the Holston is favorable to the location, either of an easy road, or of a rail road; the distance from Port Republic, head of navigation on the former stream, to Knoxville, would be about 360 miles: in this direction

runs one of the routes examined for a national road from Washington to New Orleans; should this route be adopted, and the Tennessee improved, the Chesapeake would become connected by water with the Gulf of Mexico, with the exception of the above land communication. Such a connexion would be highly beneficial to those rich and fertile districts lying between the Shenandoah and the Holston.

8thly. By improving the Tennessee at the Muscle Shoals, the northern parts of Alabama will be open to the trade with the States situate on the Ohio and tributaries; the articles of such trade will then be brought into fair competition with those of the same kind raised in East Tennessee.

9thly. Whilst the improvement contemplated will cause an increase of exports and imports, encourage the production, and afford cheapness to the consumer, this section of country will become provided with many articles of necessity and extensive use, whose expense of freight amounts now nearly to prohibition. Amongst these, is salt, which is sold at the price of one dollar and thirty-six cents the bushel; this price would fall one third, were it possible to import this article from New Orleans.

10thly. Should a safe and commodious navigation be obtained at the Muscle and Colbert's Shoals, the value of public and landed properties of North Alabama and East Tennessee would necessarily be raised, on account both of increase of trade and facility of exportation.

11thly. Finally, the great military advantage which has been pointed out by the Board, in their reports on a national road from Washington city to New Orleans, in relation to a route through Tennessee, can be, with equal force, applied to a commodious navigation from Knoxville to the Mississippi. Indeed, through this water communication, the States on the Gulf of Mexico might, in case of foreign aggression or internal disturbances, receive a prompt and powerful relief from the hardy and dense population of Tennessee. This consideration will acquire a great weight on reflecting that the black population of those States is daily increasing; and that, having on the Gulf no harbor for men of war of the first rate, our Navy will be unable to afford to this section of our maritime frontier the same high degree of protection which she can lend to our coast on the Atlantic.

All which is respectfully submitted.

BERNARD,
Brig. Gen. Member of the Board of Internal Improvement.
WILLIAM TELL POUSSIN,
Capt. Top. Eng. Assistant to the Board.

WASHINGTON CITY, *May* 14*th*, 1828.